



Image: Redfin



Image: Camp Hadar



Image: Compass

Weston & SampsonSM

Captains Pond Watershed Management Plan

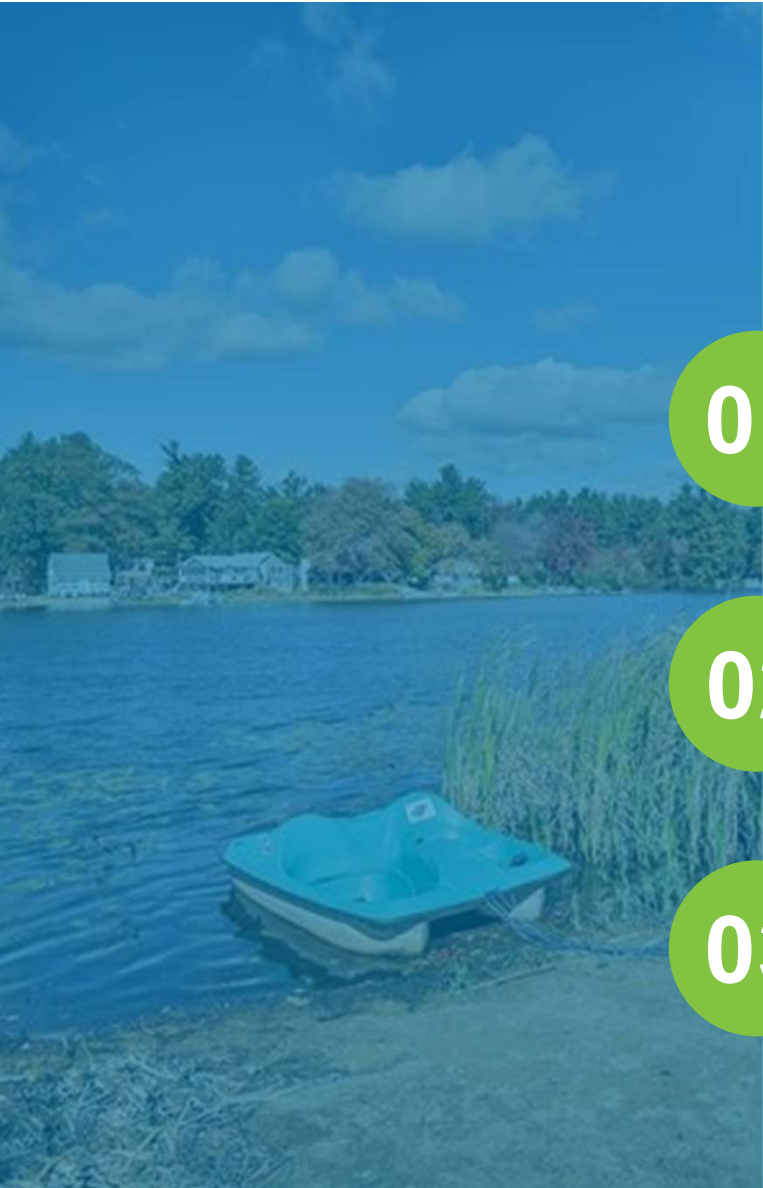
Salem, New Hampshire
Public Kickoff Meeting



**Captains Pond
Protective
Association**



December 9, 2025



AGENDA

01

Project Introduction

02

Water Quality History

03

Project Task Summary

01

Project Introduction



Project Funding Source

- The **Clean Water State Revolving Fund (CWSRF)** provides low-cost financial assistance for planning, design, and construction projects to communities, nonprofits, and other local government entities.
- Under the 2020 CWSRF program, Salem prepared a Preliminary Watershed Based Plan (WBP) and Phosphorus Source Identification Report (PSIR) for Captains Pond.
 - Preliminary WBP only considered portions of the WBP specific to Salem.
- The Town of Salem, NH was awarded \$100,000 from NHDES through the CWSRF Program for the expansion of the Preliminary WBP to consider all watershed municipalities (Salem, Atkinson, Haverhill).



01

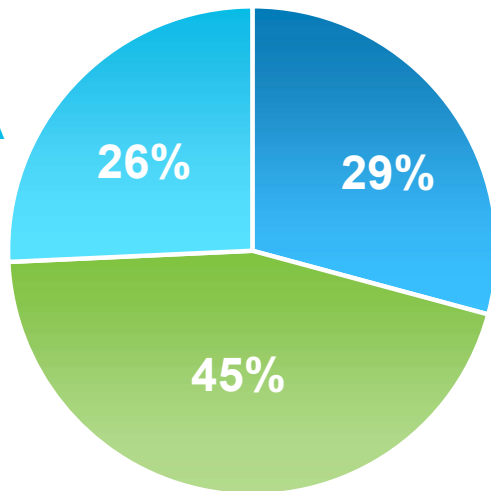
Project Introduction

Captains Pond Watershed

1,142-acre watershed

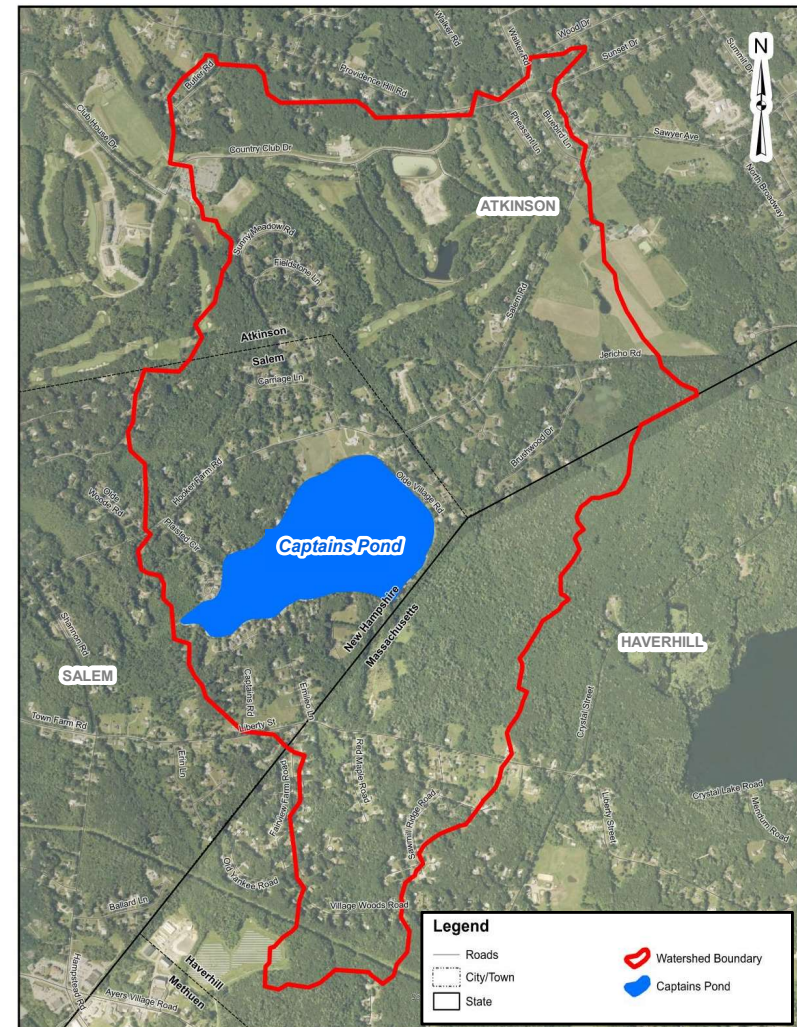
Captains Pond Watershed Area

Haverhill, MA



Atkinson, NH

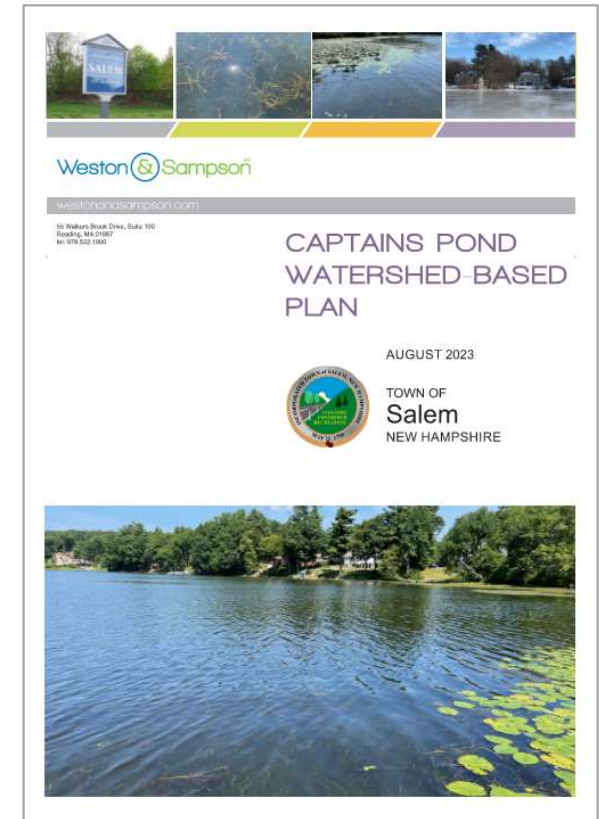
Salem, NH



Preliminary Watershed Based Plan (WBP) and Phosphorus Source Identification Report (PSIR)

- Initial In-Lake Water Quality Data Review
- Salem, NH Watershed Land Use Analysis
- In-Lake sampling and Vegetation Survey
- Identification of SCM opportunities in Salem
- Two Public Meetings

psir



01 Project Introduction

Watershed Management Plan



Identify and quantify **pollutant sources**



Determine potential **solutions**



Develop plan to **implement**



Develop plan to **reassess**

Nonpoint Source (NPS) Pollution

- NPS discharge **indirectly** to waterways
 - Lawn care
 - Winter road maintenance
 - Urban runoff
 - Forestry
 - Septic leaks
 - Agriculture runoff
 - Marinas and boating
 - Pet/animal waste
 - Leaf litter
 - Construction erosion



Source: yardcare.com



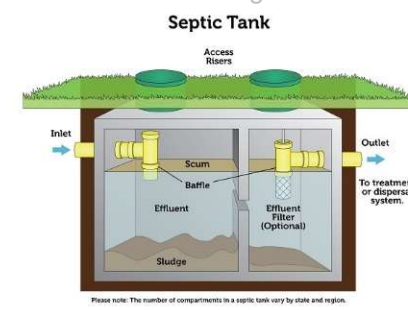
Source: nhlakes.org



Source: epa.gov



Source: epa.gov



Source: epa.gov



Source: weforum.org



Source: des.nh.gov



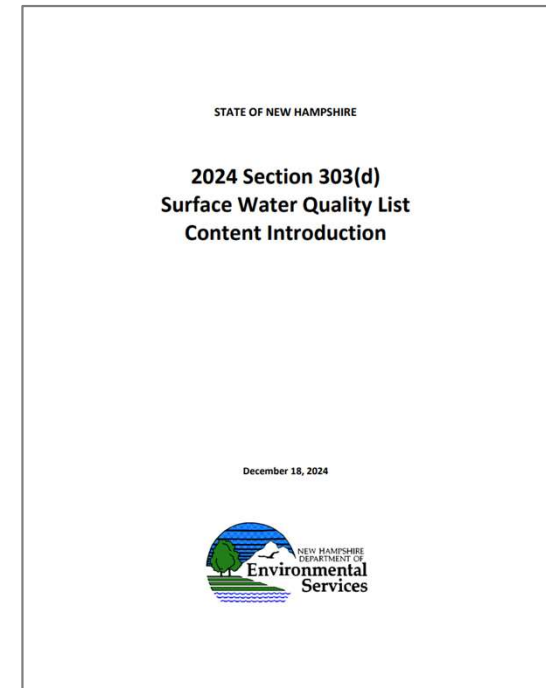
Source: shilohsvet.com



Source: usgs.gov

Water Quality Impairments

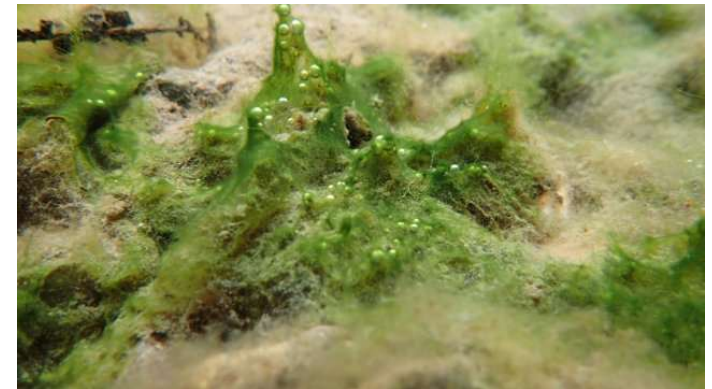
- **Impairments:**
 - *E. coli*
 - Total Phosphorus
 - Dissolved Oxygen
- **Total Maximum Daily Load (TMDL)** for Phosphorus for Captains Pond (September 2017)
 - A TMDL identifies the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards



The **Section 303(d) List** identifies surface waters impaired or threatened by pollutants

What is cyanobacteria?

- **Cyanobacteria (blue-green algae)** are microscopic organisms found in lakes, rivers, and oceans.
- Excessive growth can lead to harmful blooms, impacting aquatic ecosystems.
- Some cyanobacteria produce toxins, known as **cyanotoxins**, that can negatively impact human health.
 - Can cause nausea, vomiting, diarrhea, mild fever, skin rashes, eye and nose irritations, numbness and general malaise.



Source: epa.gov



Source: des.nh.gov

Cyanobacteria Bloom History

Identifier: Captains.Salem

NHDES

Updated: March 27, 2025

Cyanobacteria warnings are issued from May 15 to October 15. Watches are issued year-round.

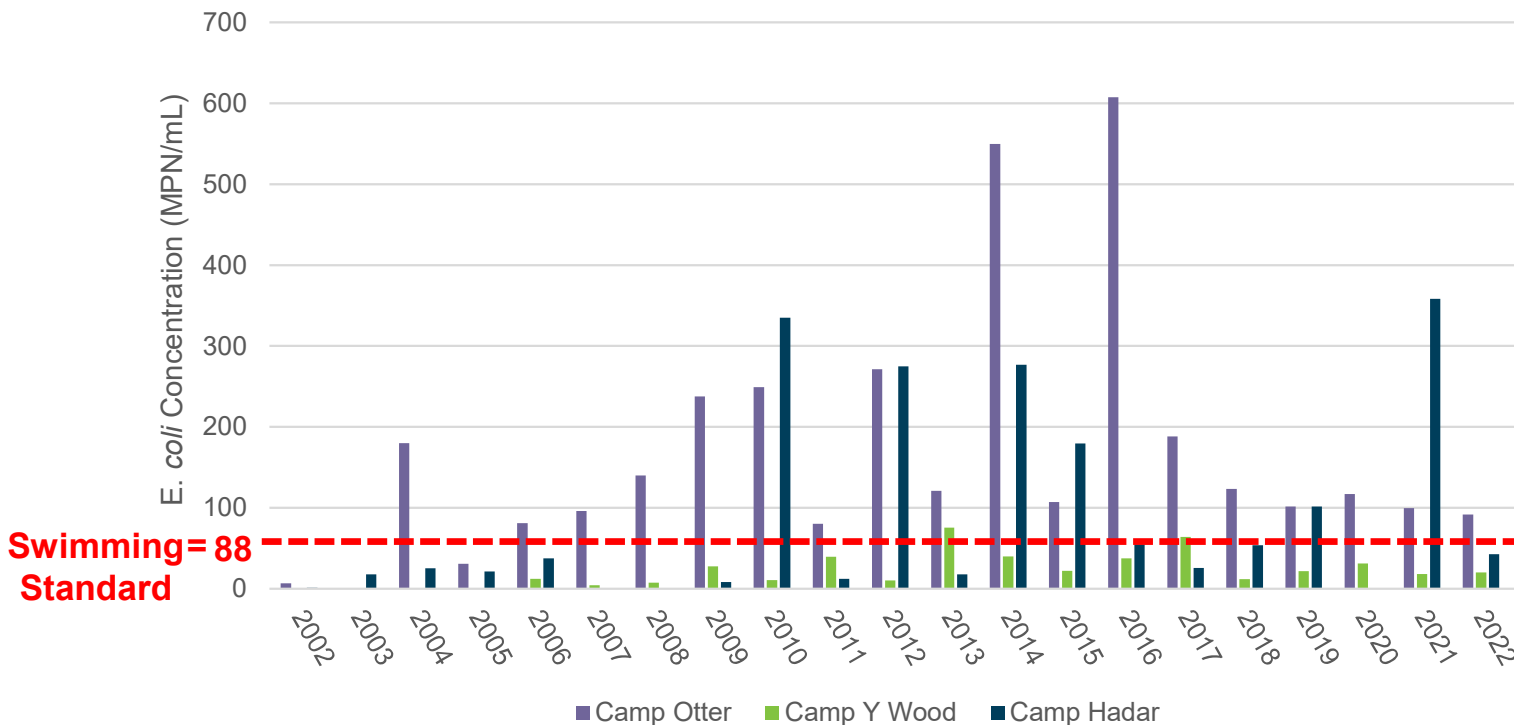
Type of Notification	Date Issued	Date Removed	# of Days Issued	Dominant Taxa	Initial Cyanobacteria Cell Density (cells/mL)
Warning	6/20/2019	7/2/2019	12	<i>Anabaena/Dolichospermum</i>	6,250,000
Watch	7/7/2022	**	**	**	**
Warning	9/14/2022	9/29/2022	15	<i>Dolichospermum</i>	76,000
Warning	8/4/2023	8/18/2023	14	<i>Planktothrix, Aphanizomenon</i>	too numerous to count (TNTC)
Watch	5/21/2024	5/28/2024	7	<i>Dolichospermum</i>	6,667

02

Water Quality History

Bacteria

E. coli Concentrations at Swimming Beaches at Captains Pond, 2002-2022



Eight (8) beach fecal bacteria advisories since 2015

- Camp Hadar: 1
- Camp Otter: 6
- Camp Y Wood: 1

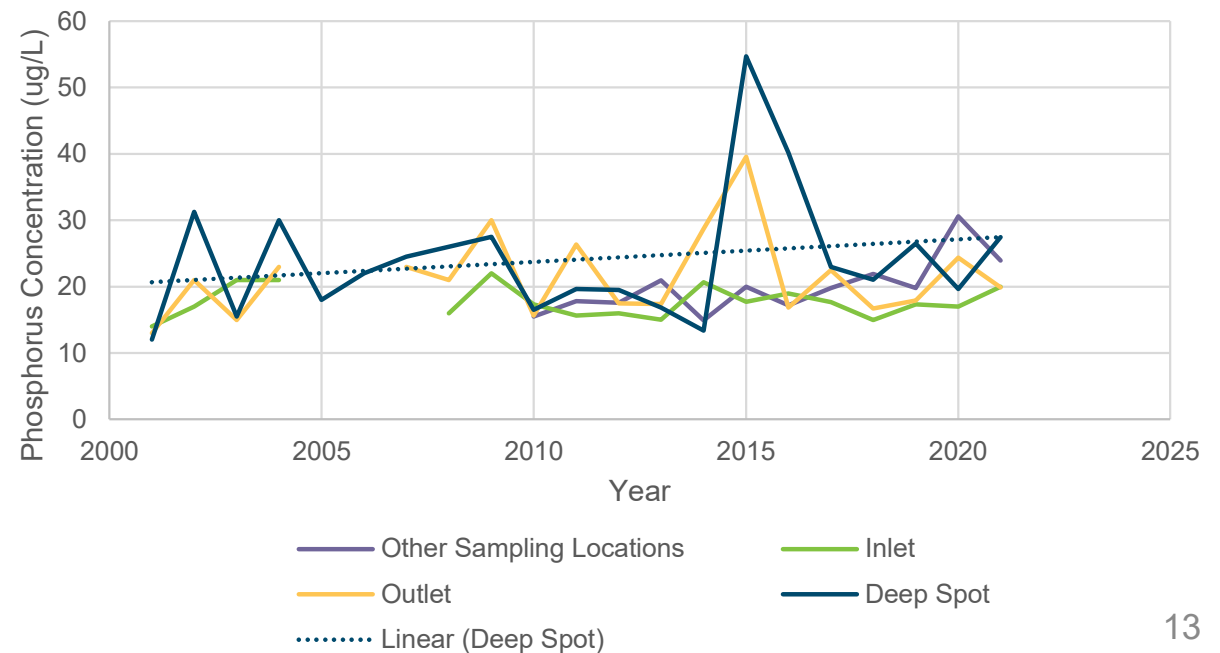


Source: meredithnh.gov

Total Phosphorus

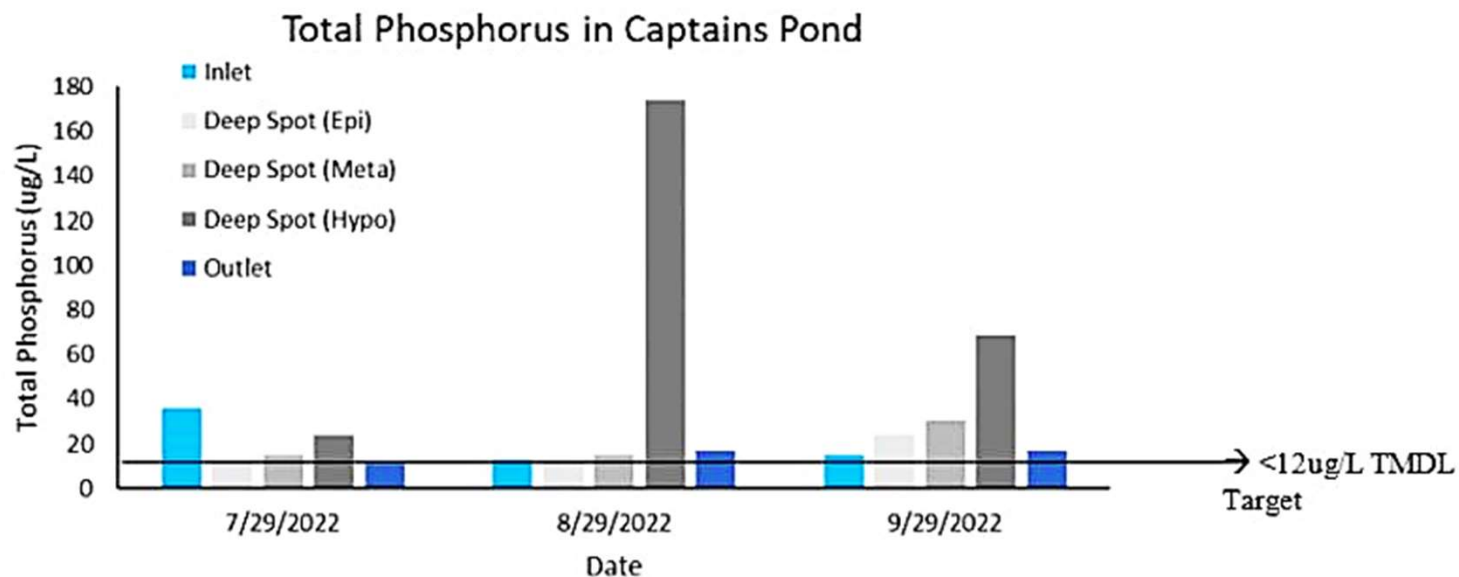
- Total phosphorus concentrations and number of cyanobacteria advisories are **increasing**

Historical In-Lake Phosphorus Concentrations at Captains Pond, 2001-2021



Water Quality Snapshot – Summer 2022

- Water chemistry, algae, and sediment samples collected July-Sept 2022
 - Nutrient levels in Captains Pond are rising, increasing algae and plant growth
 - In-lake and external nutrient loading is likely occurring



Ongoing and Completed Field Work

- Dry-weather outfall inspections & sampling completed in Winter 2021
- Wet-weather outfall sampling completed March 2022
- Catchment investigations began in 2020 and are ongoing
- Vegetation survey & in-pond water quality sampling July to Sept. 2022



Addressing Lake Pollution

- Structural Stormwater Control measures (SCMs)
- Non-structural practices
 - Street sweeping
 - Catch basin cleaning
 - Leaf litter collection
 - Stormwater education (pet waste, lawn fertilizer)
 - Septic system education

Structural Stormwater Control Measures



Bioretention/Rain Garden

Source: www.epa.gov



Wet Pond

326 N Broadway



Permeable Pavement

Source: www.epa.gov



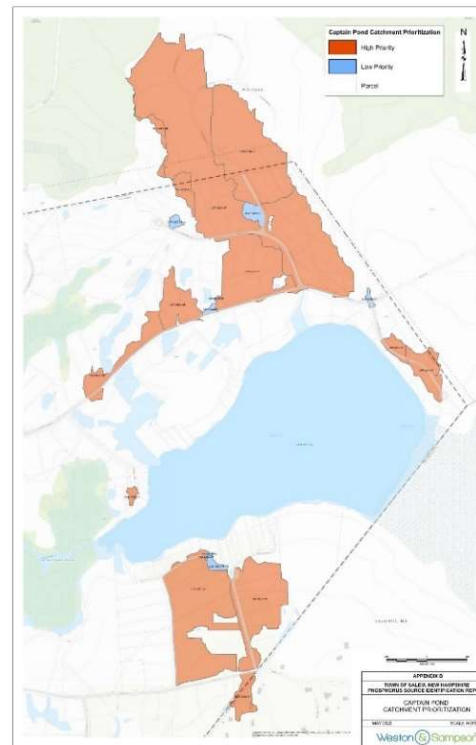
Bioswale

7 Millville Drive 16

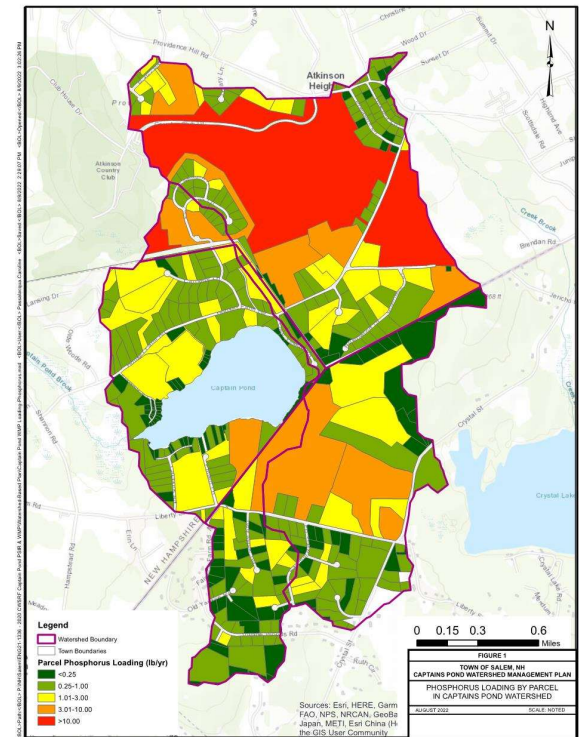
Identified Sources in the Watershed

- Stormwater runoff from high priority parcels and right-of-way areas
- Identified using NHDES Hot Spot data and land use/land cover data from Massachusetts
- Waterfowl loading
- Septic system loading

High-Priority Catchment Areas for Phosphorus Loading

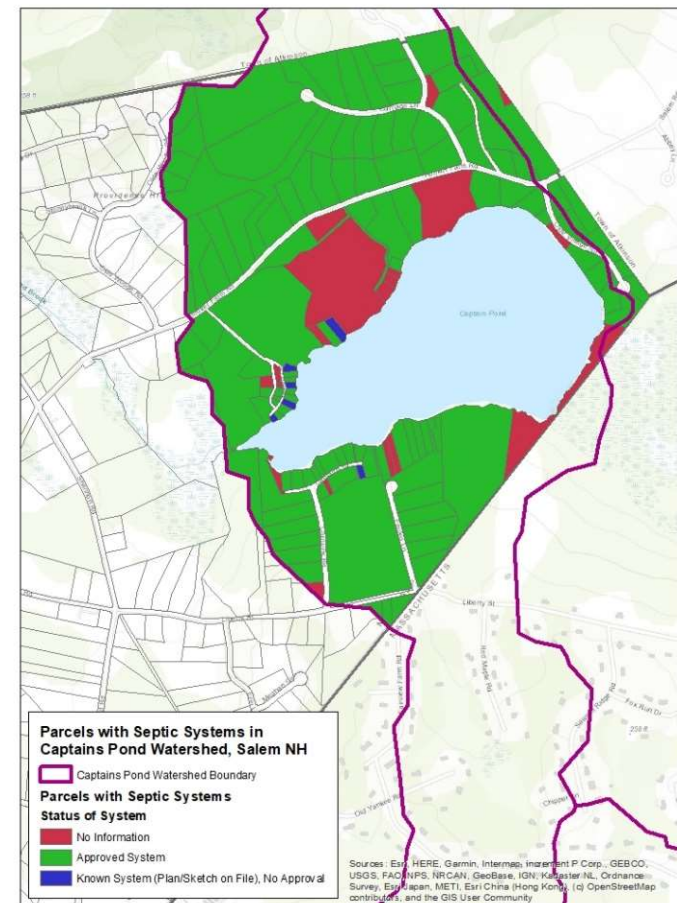


Phosphorus Hot Spot Parcel Map



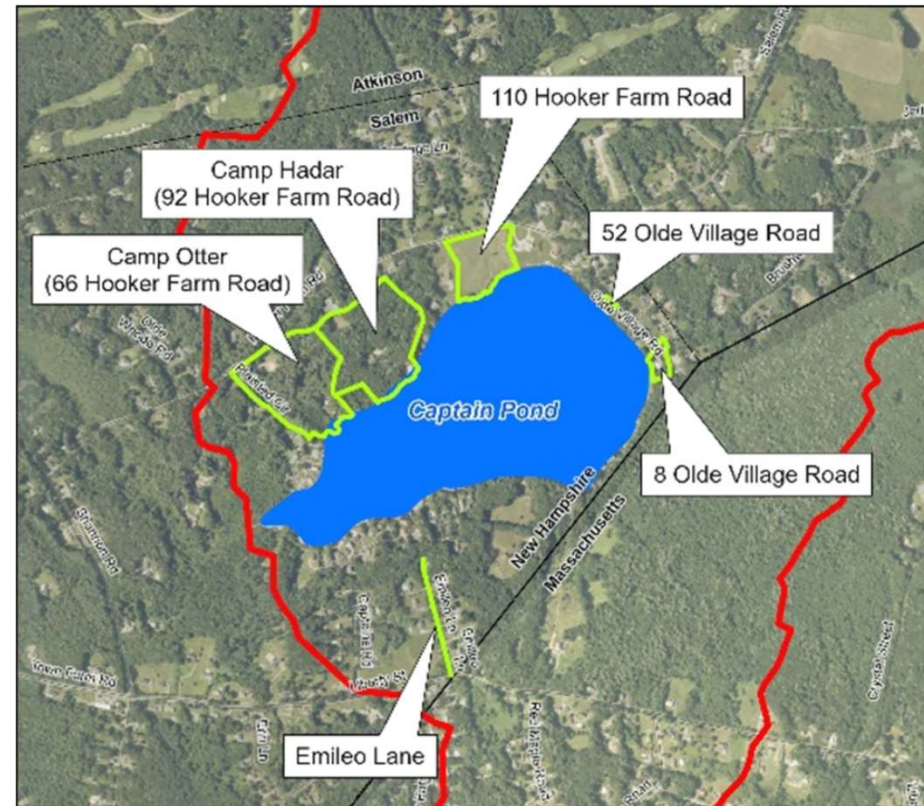
Septic System Monitoring

- Only one record of a failed system since 1990; system was replaced
- Need to expand inventory to include parcels in Atkinson and Haverhill, MA



Potential Structural SCM Locations

- 8 Olde Village Road
- 52 Olde Village Road right-of-way
- Camp Hadar and Camp Otter
- 110 Hooker Farm Road
- Emileo Lane cul-de-sac



Existing Structural Stormwater Control measures (SCMs)

- Captains Drive Rain Garden (2018)
 - Updates to drainage infrastructure
 - Bioretention area installed downstream of outfall
- Plaisted Circle Drainage Improvements (2020)
 - Updates to drainage infrastructure
 - Removal of two direct stormwater discharges
 - Rerouting of stormwater to a wetland area



Rain garden located at 7 Captains Dr

03 Project Task Summary

Watershed Management Plan



Identify and quantify **pollutant sources**



Determine potential **solutions**



Develop plan to **implement**



Develop plan to **reassess**

EPA's Nine Required Elements



**POLLUTANT SOURCE
IDENTIFICATION**



**ESTIMATED LOAD
REDUCTIONS**



MANAGEMENT MEASURES



**COST & TECHNICAL
ASSISTANCE ESTIMATE**



EDUCATION & OUTREACH



**IMPLEMENTATION
SCHEDULE**



MEASURABLE MILESTONES



EVALUATION CRITERIA



LONG-TERM MONITORING

Task 1 Project Management

Task 2 Draft Site-Specific Project Plan (SSPP)

Task 3 Data Review

Task 4 Establish Water Quality Goal

Task 5 Pollutant Load Modeling

Task 6 Assess Stormwater Treatment Methods

Task 7 Update Preliminary WBP

Task 8 Preliminary SCM Design

- **Task 1 – Project Management**

- Establish Steering Committee
- Progress Updates



- **Steering Committee Role**

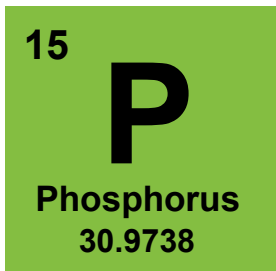
- Attend monthly meetings
- Provide input on key aspects of the WBP including the water quality goal and locations for the SCMs.
- Provide input on the plan from a local perspective

- **Task 2 – Site Specific Project Plan (SSPP)**
 - Review by NHDES
 - Finalize SSPP

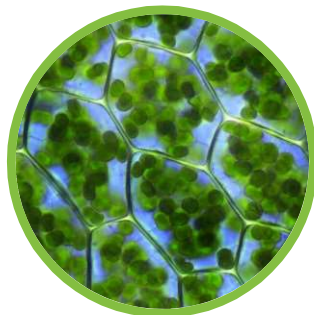


- **Task 3 – Data Review**

- Total Phosphorus ⁽¹⁾
- Chlorophyll-*a* ⁽²⁾
- Dissolved Oxygen ⁽³⁾
- Secchi Disk Transparency ⁽⁴⁾
- Outfall Data ⁽⁵⁾



(1)



(2)



(3)



(4)



(5)

26

- **Task 4 – Establish Water Quality Goal**

- Established by the Steering Committee
- Based on the water quality analysis
- Actions that may be proposed to work towards meeting goal:
 - Waterfowl management
 - Watershed load control
 - SCM retrofits
 - Nonstructural practice changes
 - Wetland restoration/preservation
 - Land Use ordinance updates
 - Prevent future loading



**In-lake Total
Phosphorus
Concentration
Goal**

- Task 5 – Pollutant Load Modeling**



Develop Existing
Conditions Model

Calculate pollutant loading
Calculate in-pond WQ

Calibrate

Based on available data

Load Reduction
Analysis

Determine reductions needed
to meet WQ goal

Lake
Loading
Response
Model
(LLRM)

**LLRM method
depicts:**

- Background conditions
- Current in-pond conditions

Lake Loading Response Model (LLRM, also called SHEDMOD or ENSR-LRM)

- Developed by the consulting firm AECOM for use in New England and modified for New Hampshire lakes
- Excel-based model that uses environmental data to develop a water and nutrient loading budget for lakes/ponds and their tributaries
- Used for TP loading assessment in Captains Pond TMDL
 - Comparison of TMDL model output with the project model run

- **Task 6 – Assess Stormwater Treatment Methods**
 - Watershed Field Assessment
 - Identification of potential sites for SCMs
 - Desktop/GIS analysis
 - Field investigations
 - Build off of preliminary plan



- **Task 7 – Update Preliminary WBP**
 - Expand to include Atkinson & Haverhill areas
 - Update Action Plan
 - Potential Funding Sources
 - Required Regulatory Updates
 - Implementation Schedule / Milestones
 - Progress Indicators
 - Undergo NHDES Review



- **Task 8 – Preliminary Stormwater Control Measure (SCM) Design**
 - Desktop analysis for up to three (3) proposed locations
 - 30% design drawing for the most favorable site



Thank you!

Questions?

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